

# Comparison of Language Features, Autism Spectrum Symptoms in Children Diagnosed with Autism Spectrum Disorder, Developmental Language Delay, and Healthy Controls

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## ABSTRACT

**Introduction:** Language and communication is very important in social, emotional, and cognitive development of children. Delay in language is the first complaint for children diagnosed with autism spectrum disorder (ASD) or developmental language delay (DLD). In this study it is aimed to evaluate and compare language profiles and autistic symptoms between children diagnosed with ASD, DLD, and healthy controls.

**Method:** Twenty-six children who are diagnosed with ASD, 43 children who are diagnosed with DLD, and 47 healthy controls are included to study; and all children are in the age of 48–72 months. Test of Early Language Development was used to evaluate language profiles, and autism spectrum symptoms were evaluated with social communication questionnaire (SCQ).

**Results:** The sociodemographic features of groups were similar. The statistical significant differences were found in all language subscales

and subscales of SCQ among three groups. Both children who were diagnosed with ASD and DLD had more autism spectrum symptoms when compared to controls.

**Discussion:** In present study, it is indicated that developmental language trajectories are different in ASD and DLD group. Children, who are diagnosed with ASD, have more receptive language difficulties while children, who are diagnosed with DLD, have more language difficulties in expressive language area. The finding, children who are diagnosed with DLD have more autistic symptoms, shows that autistic symptoms are related with language development, and it is very important to give preference to language education in the treatment.

**Keywords:** Autism spectrum disorder, developmental language delay, expressive language, receptive language

**Cite this article as:** Özyurt G, Dinsever Eliküçük Ç. Comparison of Language Features, Autism Spectrum Symptoms in Children Diagnosed with Autism Spectrum Disorder, Developmental Language Delay, and Healthy Controls. Arch Neuropsychiatry 2018;55:205-210. <https://doi.org/10.5152/npa.2017.19407>

## INTRODUCTION

Babies acquire language via social interaction which is a tool only peculiar to humans ensuring to communicate with other people and making it easier to learn about world (1). Adults can direct babies' attention to objects and activities in the environment with shared events such as imitation and joint attention (2-4). It is thought that both receptive and expressive language develop through social communication in the first and second year of life; gradually increasing serial games, using gestures and mimics to share joint attention with others and express needs and wishes (2,5,6).

Autism spectrum disorder (ASD) is a neurodevelopmental disorder defined with limited interest and repetitive behaviour, insufficiency in mutual social communication and interaction; generally emerging prior to 3 years old and continuing whole life. It involves the difficulties in social communication, mutual social communication, non-verbal social behaviour and establishment of social relationships. Limited and repetitive behaviour also involve stereotypic behaviour or speech, extreme dependence on routines and obsessive interests. The differences in behaviour can even be seen in early childhood (7). Communication and language skills has a critical importance in terms of phenotype and prognosis of ASD. In DSM-5, however, ASD category contains two

basic characteristics; a) constant insufficiency in social communication and social interaction observed in different situations, b) limited and repetitive behaviour and in addition to these features, it is emphasized that symptoms appear in early childhood and they lead to flaws in daily life (8).

Delay in language development is one of the most frequent application reasons and distinctive features of cases diagnosed with ASD (9,10). Although early language development and language development processes have been examined by numerous researcher in cases with ASD (11-13), known facts are still very restricted regarding language features of cases diagnosed with ASD in early period.

Yet, language development levels of cases diagnosed with ASD can be very different from each other and while there is no language development delay observed in some, functional language do not improve in 25% of the cases (14). Understanding the failures in language development in cases with ASD is of great significance since parents notice failures in language development in children with ASD as a complaint primarily and language functions in early period are closely related to long-term consequences (15,16).

Developmental language delay (DLD), however, is defined as insufficiency in language development of children compared to their peers; reported in 2-9% of children aged between 2-7 and is an important developmental issue affecting the future life of children (17,18). The delays in the development of communication skills are the most common referral reason of children with developmental difficulties (19). Namely, children diagnosed with both DLD and ASD usually have language delay as the first complaint and decrease in language skills is apparent in both groups (20,21). While the problem is spontaneously solved in up to 60% of cases with developmental language delay seen in 2-3 year-old period (20), it is known that speech developing at an early age in children with ASD has a critical significance with respect to long-term prognosis of ASD (15,16).

While repetitive behaviour and limited interest are taken into consideration in the diagnosis of ASD, the condition of these symptoms have not been studied in children with DLD. In a study that cases with developmental delay were compared in terms of repetitive behaviour; it was found out that children with developmental delay in pre-school period had more repetitive behaviour in compared to children with normal development; repetitive behaviour of children increased as the cases with developmental delay grew older (22). While it was revealed in previous studies that children with developmental delay display more stereotypical behaviour compared to those with normal development, stereotypic behaviour in children going through developmental language delay has not been analyzed before (23,24). According to studies carried out, stereotypic behaviour can be seen in infants displaying normal development as a part of normal motor development and these behaviour begin to reduce after 2 years of age (25). Stereotypic behaviours are continued to be seen in children undergoing delay in motor development, diagnosed with Down syndrome and developmental delay at advancing ages (22,24,26).

Though the cases diagnosed with DLD and ASD were compared in terms of language characteristics previously, they have never been compared with respect to their ASD features. Examining the symptoms of ASD in cases with DLD is of great importance in distinguishing similar features of cases diagnosed with ASD and DLD with regard to ASD symptoms and understanding neuronal terms related to these features and acquiring a new perspective in the treatment.

In the present study, it was aimed to analyze ASD symptoms and language development features in cases with DLD and ASD; compare them to children with normal development and examine the relationship between ASD symptoms and language development features.

## METHOD

A total of 26 children diagnosed with ASD and 43 children with DLD in whose homes Turkish is the only language and 47 healthy children with no language problem in their first degree relatives formed the sample of the research who applied to Nevşehir State Hospital between August 2015-May 2016 and aged between 48 and 72 months. ASD diagnosis was made according to DSM-5 criteria; cases applied with language delay and compatible with other development fields' age were not involved in the study by diagnosing them with DLD. While diagnosing DLD, it was distinguished from other communication disorders with the evaluation of speech and audiology expert. In the study, Denver II Developmental Screening Test and Turkish Early Language Developmental Test (TELDT) were used; social communication questionnaire was utilized to examine the symptoms of children with ASD. The ethics committee approval of the study was obtained from Nevşehir Hacı Bektaş Veli University Noninvasive Clinical Research Ethics Committee. Oral and written consents of mothers and children included in the study were acquired.

## Denver II Developmental Screening Test (DDST)

It was prepared by Frankenburg and Dodds in 1967 and many countries standardized by adapting it to their own countries (27). It is the first and only developmental test standardized for Turkish children. It was formed by reviewing it in Turkey in 1990. DDST is an easily implemented test for children aged between 0-6 and it has an important place in the observation and early recognition of development and developmental deviation of children particularly in this period.

Four fields;

- personal-social: the ability of understanding people, meeting personal requirements,
- fine motor: hand-eye coordination, being able to use small objects, problem solving ability,
- language: hearing, comprehension and language use, expressive and receptive language skills and
- gross motor: the movement of large muscles such as sitting, walking, jumping are evaluated.

Turkish validity and reliability study was carried out by Anlar and Yalaz.

## Test of Early Language Development - Third Edition (TELD-3)

It is an assessment instrument based on norm and developed by Hresko, Reid and Hammil (1999) in U.S.A to evaluate expressive and receptive language skills of children aged between 2 years 0 month and 7 years 11 months old (29). It is widely used for purposes such as recognizing children with language disorders in early period, showing poor and powerful sides of their language development, informing and researching about their developmental period (30). The test was adapted with the title of The Test of Early Language Development (TELD) in terms of simplicity of use in Turkish. TELD, involving three out of five components of language, evaluates subtests and comprehension, syntax and morphology with test items. TELD involves two subtests as receptive and expressive language.

There are 24 articles evaluating semantic information in A Form Receptive Language Subtest; 25 articles evaluating semantic information in B Form Receptive Language Subtest; 13 articles assessing syntax/morphology in A Form Receptive Language Subtest; 12 articles assessing syntax/morphology in B Form Receptive Language Subtest. There are 22 articles evaluating semantic information in A Form Expressive Language Subtest; 24 articles evaluating semantic information in B Form Expressive Language Subtest; 17 articles assessing syntax/morphology in A Form Expressive Language Subtest, 15 articles assessing syntax/morphology in B Form Expressive Language Subtest. In case of procurement of passing criteria indicated near the numbered articles in forms, 1 score is considered as correct; in case of not being able to procure, however, it is considered as incorrect with 0 score (or "could not pass"). Raw scores were transformed into standard scores from the tables found at the back of the Performer's Handbook. In the study, TEDIL-A form was utilized.

## Social Communication Questionnaire(SCQ)

SCQ is a scale composed of 40 articles in which autistic symptoms are questioned and primary caretaker fills in. Every article is answered as yes/no with 1 or 0 scores reflecting the presence or absence of ineligible developmental behaviour. The first article is regarding whether 58 children speaks with short or long sentences and it is not scored. Total scores are between 0-39. The first 19 articles evaluate general behaviour and the last 20 articles assess behaviour aged between 4 and 5. Cutoff score for ASD was recommended as  $\geq 15$  (31,32). Turkish validity and reliability of the score was carried out by Avcil et al (33).

## RESULTS

While the chronological age of children diagnosed with ASD was  $54.46 \pm 7.21$ , the average age of those with DLD was  $54.11 \pm 6.40$  and that of control group's was  $55.25 \pm 9.16$ ; when groups were compared with Kruskal-Wallis test, no statistically significant difference was found between groups (Kruskal Wallis test;  $p=0.959$ ). When it is compared in terms of mental age according to data obtained from Denver developmental test; while the mental age of children with ASD was  $34.62 \pm 4.26$ , it was  $47.16 \pm 4.82$  in children with DLD and it was  $53.98 \pm 7.69$  in control group; there was a statistically significant difference between

**Table 1.** Comparison of groups with chronological age. intellectual age. speech level and sociodemographic data

	DLD	ASD	Control	P
Chronological age	$54.11 \pm 6.40$	$54.46 \pm 7.21$	$55.25 \pm 9.16$	0.959
Intellectual age	$47.16 \pm 4.82$	$34.62 \pm 4.26$	$53.98 \pm 7.69$	<0.001
Speech level	$41.39 \pm 4.81$	$31.15 \pm 5.37$	$53.97 \pm 7.69$	<0.001
Sex	15 kız 28 erkek	8 kız 18 erkek	10 kız 37 erkek	0.345
Maternal age	$32.11 \pm 2.79$	$33.69 \pm 3.57$	$32.40 \pm 5.19$	0.115
Maternal education				
<8 years	24	13	23	0.792
>8 years	19	13	24	
Maternal occupation				
Housewife	22	13	18	0.417
Working	21	13	29	

DLD, Developmental Language Delay; ASD, Autism spectrum disorder

**Table 2.** Comparison of groups with language subtests and social communication questionnaire

	DLD	ASD	Control	P
Receptive language semantics	$14.86 \pm 1.72$	$3.69 \pm 1.43$	$21.44 \pm 2.59$	<0.001
Receptive language syntax	$11.17 \pm 1.97$	$4.30 \pm 2.18$	$11.79 \pm 1.37$	<0.001
Receptive language total	$26.65 \pm 2.75$	$7.75 \pm 3.29$	$32.63 \pm 3.00$	<0.001
Receptive language standard	$110.56 \pm 6.05$	$56.03 \pm 3.76$	$128.09 \pm 10.20$	<0.001
Expressive language semantics	$14.39 \pm 1.95$	$6.50 \pm 1.60$	$20.91 \pm 1.82$	<0.001
Expressive language syntax	$8.57 \pm 1.85$	$8.41 \pm 1.69$	$14.63 \pm 1.96$	<0.001
Expressive language total	$22.81 \pm 2.00$	$15.07 \pm 2.71$	$35.21 \pm 2.05$	<0.001
Expressive language standard	$87.97 \pm 4.50$	$66.26 \pm 4.31$	$132.26 \pm 12.83$	<0.001
SCQ-communication	$1.95 \pm 1.32$	$5.15 \pm 1.46$	$0.91 \pm 1.19$	<0.001
SCQ-social interaction	$1.51 \pm 0.88$	$8.30 \pm 2.50$	$0.72 \pm 0.77$	<0.001
SCQ- stereotypical behavior	$3.09 \pm 1.61$	$6.92 \pm 1.19$	$1.31 \pm 1.53$	<0.001
SCQ-total	$6.55 \pm 3.26$	$20.38 \pm 3.51$	$1.78 \pm 2.40$	<0.001

DLD, Developmental Language Delay; ASD, Autism spectrum disorder SCQ, Social Communication Questionnaire.  
Kruskal-Wallis test was used to compare the groups.

**Table 3.** Binary comparison of groups with chronological age. intellectual age. speech level. language subtests and social communication questionnaire

P	ASD-DLD	ASD-Control	DLD-Control
Chronological age	0.751	0.968	0.843
Intellectual age	<0.001	<0.001	<0.001
Speech level	<0.001	<0.001	<0.001
Receptive language semantics	<0.001	<0.001	<0.001
Receptive language syntax	<0.001	<0.001	0.078
Receptive language total	<0.001	<0.001	<0.001
Receptive language standard	<0.001	<0.001	<0.001
Expressive language semantics	<0.001	<0.001	<0.001
Expressive language syntax	0.939	<0.001	<0.001
Expressive language total	<0.001	<0.001	<0.001
Expressive language standard	<0.001	<0.001	<0.001
SCQ- communication	<0.001	<0.001	<0.001
SCQ-social interaction	<0.001	<0.001	<0.001
SCQ- stereotypical behavior	<0.001	<0.001	<0.001
SCQ-total	<0.001	<0.001	<0.001

DLD, Developmental Language Delay; ASD, Autism spectrum disorder SCQ, Social Communication Questionnaire.

\* Mann-Whitney U test was used to compare groups.

groups (Kruskal-Wallis test;  $p<0.001$ ). When speech levels were evaluated in accordance with Denver developmental test, however, speech age level was  $31.15 \pm 5.37$  in children with ASD, on the other hand, the average of speech age was  $41.39 \pm 4.81$  in children with DLD and it was found as  $53.97 \pm 7.69$  in control group; there was a difference between groups in terms of statistics (KruskalWallis test;  $p<0.001$ ). There was no difference between groups in terms of their distribution of sex, mothers's age, mothers's educational background and mothers' employment status. Sociodemographical features of groups were shown in Table 1. When groups were compared with regard to their receptive and expressive language skills and social communication questionnaire and subscales with Kruskal-Wallis test, a significant difference was determined between groups in terms of their subscales of all language skills and social communication questionnaire; the values acquired from language skills were given in Table 2 ( $p<0.001$ ). When ASD and DLD groups were compared in terms of their language skills with MannWhitney U test, the scores of expressive language morphology were similar; when the group with DLD was compared with healthy controls via Mann-Whitney U test once again, it was discovered that receptive language morphology scores were similar; there was a statistical difference amid other all scores and they were shown in Table 3. The relationship between receptive and expressive language skills and social communication questionnaire was evaluated with Spearman's correlation analysis and they were given in Table 4.

## DISCUSSION

In the present study, receptive and expressive language skills of children aged between 48-72 months-old and diagnosed with ASD or DLD were compared with autism spectrum symptoms and those of control

**Table 4.** Correlation analysis of language subtests and social communication questionnaire

	<b>TELD receptive language</b>	<b>TELD expressive language</b>	<b>SCQ-communication</b>	<b>SCQ- social interaction</b>	<b>SCQ- streotypical behavior</b>	<b>SCQ-total</b>
TELD receptive language	r: 1	p: <0.001 r: 0.907	p: <0.001 r: -0.672	p: <0.001 r: -0.679	p: <0.001 r: -0.734	p: <0.001 r: -0.754
TELD expressive language	p: <0.001 r: 0.907	r: 1	p: <0.001 r: -0.702	p: <0.001 r: -0.707	p: <0.001 r: -0.756	p: <0.001 r: -0.787
SCQ- communication	p: <0.001 r: -0.672	p: <0.001 r: -0.702	r: 1	p: <0.001 r: 0.664	p: <0.001 r: 0.854	p: <0.001 r: 0.921
SCQ-social interaction	p: <0.001 r: -0.679	p: <0.001 r: -0.707	p: <0.001 r: 0.664	r: 1	p: <0.001 r: 0.705	p: <0.001 r: 0.809
SCQ- streotypical behavior	p: <0.001 r: -0.734	p: <0.001 r: -0.756	p: <0.001 r: 0.854	p: <0.001 r: 0.705	r: 1	p: <0.001 r: 0.957
SCQ-total	p: <0.001 r: -0.754	p: <0.001 r: -0.787	p: <0.001 r: 0.921	p: <0.001 r: 0.809	p: <0.001 r: 0.957	r: 1

DLD, Developmental Language Delay; ASD, Autism spectrum disorder SCQ, Social Communication Questionnaire.

\*Spearman correlation analysis was used

group. It was seen in the study that ASD and DLD groups have different developmental language features. In our study, it was found out that children with ASD go through difficulties in receptive language, on the other hand, those with DLD undergo difficulties in expressive language, similarly in the studies comparing the cases diagnosed with ASD and DLD (34,35).

Although the language features of cases with ASD display differences among individuals, the difficulties in language skills are apparent particularly in children with ASD. While receptive language development improves faster than expressive language in children with normal development, there are difficulties and delay especially in children with ASD (36). Echolalia and unusual prosody are among the features that there are difficulties in the continuation of conversation and impairments particularly in receptive language. In addition, these symptoms are those unique to ASD that are not encountered in DLD or other disorders. Inadequacy in responding homonymic words and speech in children with ASD are other symptoms showing that there is a problem in their receptive language skills. Children diagnosed with ASD mostly cannot understand the humour and cannot perceive what people laugh at when they joke themselves (36).

Speech development before 5 years old is one of the most significant predictor factors for cases with ASD and it boosts the importance of recognition of neural circuits related to speech disorders seen in children (37). Language and communication disorders are commonly observed in ASD and related studies have focused on the temporal region of the brain that is associated with basic audiological process and complicated speech skills displaying connection and function changes in previous brain imaging studies, as well (38–42). Grey matter loss was determined substantially in the right and left planum temporale in cases with ASD when compared to that of healthy control group. This finding has been emphasized to be related to early neurodevelopmental disorder impairing language development in ASD (43). Although abnormalities in temporal region are believed to be linked to language disorders in ASD (44,45), the relationship between abnormal brain structure and function and behavioral phenotype of ASD is not completely understood.

In a study carried out by Abell et al in which cases with ASD were analysed with voxel based morphometry, it was found out that grey substance reduced in inferior frontal gyrus (46). In previous studies, it was shown

that asymmetry changed in broca's area (47,48). Especially in cases that speech is not developed, there was a right asymmetry in pars opercularis and pars triangularis areas (48). When cases with ASD were examined with functional imaging methods, however, changes were particularly observed in superior temporal gyrus. In a study conducted by Bigler et al in which the relationship between superior temporal gyrus and language was examined, a positive correlation was determined between receptive language and superior temporal gyrus size in children with no ASD diagnosis (49). The same correlation could not be shown in children with ASD. As there are differences in the language characteristics of cases diagnosed with ASD and DLD, there can also be structural and functional differences in the brain regions concerned with these language features.

Defining underlying developmental course of language development is of great importance in the determination of treatment approach and probably prevention of 1.5% children (50) diagnosed with ASD in community and those with speech disorder seen at 6–7% (51). While some children diagnosed with ASD cannot speak throughout their lives, those speaking fluently (52,53) and ranking disorder in social communication among ASD diagnosis criteria (8) make us think that language developments of children with ASD must be examined. Although language development explosion occurs in the second year of their lives (54,55), ASD diagnosis is usually made after 2 years of age (56). Thus, studies concerned with social communication and language development are directed to siblings of children diagnosed with ASD and owing to having a likely ASD diagnosis of these children at 7–19% (57,58) and possibilities of having developmental language delay at %20 or emergence of general developmental delay (59), they are defined as “babies with high risk”. It has been tried to be understood that babies with high risk should be examined in terms of early precursors of ASD and with which symptoms they are diagnosed with ASD in the future or which high risk babies continue their normal growth (60,61). In general, language delay is seen in the second or third years of babies with high risk (62–64). While there is no study associated with scanning of ASD symptoms in cases with DLD, there are numerous cross-sectional and follow-up studies concerned with “babies with high risk” showing a similar characteristic to cases with DLD and it was found out that high risk babies displayed more autistic symptoms compared to controls in these studies (62–64).



When autism spectrum disorder is examined in terms of its symptoms, the finding that children with DLD go through more difficulties in all subscales of social interaction, communication and stereotypical behaviour compared to those with normal development is very important which makes us think that language development and ASD symptoms are closely related to each other. While it is known that stereotypical behaviour are more frequently seen in children with developmental delay compared to those with normal development (26,27), the findings of this study can be considered as a preliminary study symptom that they can be observed more often in children undergoing developmental language delay. Nevertheless, SCQ subscales obtained after Spearman correlation analysis and potent negative relation between TELD expressive and receptive language, that is, the finding that when autism symptoms increase, language abilities reduce shows close relationship of ASD symptoms on language development. Insufficient language development may spoil both social communication and interaction and cause children who cannot express themselves to do repetitive behaviour.

There are some restrictions of our study; the number of cases and controls involved in the study is insufficient to generalize the results at first. Even though ASD was diagnosed according to DSM-5, the findings of the study could have been evaluated with regard to autism and enriched with structured interviews of cases and controls. The observation and evaluation of interaction between mothers and children included in the study, assessment of psychiatric condition of mothers could have enriched the study.

As a result; while this study has some restrictions, it is the first research in which the relationship between language skills of children with ASD and DLD and the symptoms of ASD were analyzed; it underlies the importance of language in treatment once more that as language skills reduce, autism spectrum symptoms increase.

**Ethics Committee Approval:** Ethics Committee approval was obtained from the Nevşehir Hacı Bektaş Veli University Ethics Committee for Non-Interventional Clinical Trials.

**Informed Consent:** Verbal and written approvals were obtained from the participants.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept - GÖ; Design - GÖ, ÇDE; Supervision - GÖ; Resource-GÖ, ÇDE; Materials - ÇDE; Data Collection and/ or Processing - ÇDE, GÖ; Analysis and/ or Interpretation - GÖ; Literature Search - GÖ, ÇDE; Writing - ÇDE, GÖ; Critical Reviews - GÖ.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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